Remarks

Telephone Interview

The courtesy and cooperation of Examiner Chen in a telephone interview on December 4, 2002 with Applicant's undersigned attorney is hereby acknowledge and gratefully appreciated. During that interview the Examiner agreed to consider an amendment to the claims that would limit their scope to antenna structures that include *finite* symmetrical ground planes, in contrast to the teachings of Wicks et al., as discussed below.

Amendments

As suggested in the above-mentioned telephone interview, independent claims 1 and 11 have been amended to make explicit the fact that the ground planes used in Applicant's invention are *finite* as well as symmetrical. Replacement claims are included above, and a version of the claims with markings is attached. In the marked-up version, underscoring shows matter added; brackets matter deleted.

No new matter has been added. Clearly, the specification as well as FIGs. 2a and 4a describe and show only ground planes that are finite and symmetrical (e.g., disk-shaped).

No new search is required. Clearly, the original search should have embraced all ground planes regardless of whether they were actually finite or designated as infinite, inasmuch as the Examiner's position is that original claims 1 and 11 were not explicitly limited to finite ground planes.

No amendments have been made to the specification.

Claim Rejections – 35 USC 102 & 103

In paragraph 2 of the Final Office action, Claims 1-9 and 11-18 have been rejected under 35 USC 102(e) as being anticipated by M. C. Wicks et al., US Statutory Invention Registration, Reg. No. H2016H, published on April 2, 2002 and filed on March 5, 1986 (hereinafter *Wicks*).

In addition, in paragraph 4 of the Final Office action, Claims 10, 19 and 21-25 have been rejected under 35 USC 103(a) as being unpatentable over Wicks et al.

These rejections are respectfully traversed for the reasons set forth in Applicant's response of July 11, 2002, which is incorporated herein by reference.

In paragraph 7 of the Office action (Response to Arguments), the Examiner takes following position regarding the arguments proffered by Applicant:

> Applicant's arguments filed July 11, 2002 have been *fully* considered but they are not persuasive.
>
> Applicant argues that the Wicks (sic) fails to teach or reasonably suggest a symmetrical ground plane. More specifically, in figures 1, 2a and 4, which is a typical depiction of an infinite ground plane. This argument is not deemed to be persuasive

> because the ground plane extends to infinity, this makes the ground plane symmetrical since extending to infinity is a form of translational symmetry. (emphasis added)

With all due respect, Applicant submits that the above-quoted Response to Arguments did not *fully* consider Applicant's arguments because it is both inaccurate and incomplete.

The Response to Arguments is *inaccurate* because the notion of an infinite ground plane is a mathematical fiction. Therefore, the notion of symmetry existing at infinity due to some form of "translational symmetry" is also a mathematical fiction. No real symmetrical structures are taught by such a mathematical fiction. Therefore, Wicks does not teach one skilled in the art to build an antenna structure that has a symmetrical finite configuration, as required by independent claims 1 and 11, nor does it reasonably suggest a symmetrical disk shaped ground plane as required by independent claim 21. Nevertheless, in an effort to further prosecution and to more clearly distinguish Wicks, claims 1 and 11 have been amended to recite *a symmetrical, finite ground plane*. In the context of a Section 102 rejection, which requires that a reference explicitly describe each and every element of a rejected claim, Wicks is totally devoid of any teaching or suggestion of such finite ground planes.

In contrast, the word *finite* has not been added to claim 21 inasmuch it would be redundant; the phrase *disk shaped* inherently requires that the ground plane be finite.

Accordingly, it is respectfully submitted that claims 1, 11 and 21 are neither anticipated nor rendered obvious by Wicks.

The Response to Arguments is *incomplete* because several arguments advanced by Applicant in the July 11, 2002 paper were not even mentioned, so it is unclear on what basis the Examiner disagrees or even considered them; to wit,

(1) Linear constant profile: Regarding dependent Claim 3, the Examiner argues that Wicks teaches in figures 1-5 the antenna structure wherein the taper comprises a *linear constant profile*. Apparently the Examiner is referring to the straight-line segment D, E, F, G of the mono-blade, which Wicks unambiguously states *is relatively unimportant and is made a straight line for manufacturing ease*. Thus, clearly Wicks does not teach or suggest to one skilled in the art that the straight-line segment has any significant functional role in the operation of the antenna. In addition, a linear-constant profile as called for in Claim 3, and as illustrated in FIG. 3(a), requires *both a constant (horizontal) segment and a linear (sloped) segment*. Clearly, Wicks is totally devoid of any teaching or reasonable suggestion of such a profile.

Dependent Claim 13 also includes a linear constant profile, and for the reasons set forth above is neither anticipated nor rendered obvious by Wicks.

(2) Cigar-like and butterfly-like beam pattern: Regarding dependent Claim 4, the Examiner argues that Wicks teaches in figures 1-5 an antenna structure that supports a *cigar-like directional three-dimensional beam pattern and a butterfly wing-like directional three-dimensional pattern*. The Examiner's assertion is totally without support. Wicks provides no mention of such beam patterns, and therefore cannot anticipate Claim 4.

Dependent Claim 14 also calls for an antenna structure that supports a cigar-like directional three-dimensional beam pattern and a butterfly wing-like directional three-dimensional pattern, and for the reasons set forth above is neither anticipated nor rendered obvious by Wicks.

(3) Phase velocity greater than the speed of light: Wicks fails to teach or reasonably suggest that the antenna structure is a *traveling wave antenna supporting a phase velocity greater than the speed of light*. In fact, Wicks teaches away from this feature of the invention; to wit, at column 2, lines 66-67 Wicks specifically teaches that the *slot transmission line has a TEM mode of propagation*. As noted in Applicant's July 11, 2002 traversal of the Section 112 rejection in the previous Office action, a TEM wave (or mode) is a *slow wave*, which means that its phase velocity is *less than* the speed of light, *not greater than* the speed of light as required by Claims 2 and 12.

(4) Design choice: First, Wicks does not teach or reasonably suggest the use of a finite symmetrical ground plane, as explained above. Second, it is Applicant's unique contribution to the art of polling antennas that symmetry is important and that a *disk shaped* ground plane is particularly useful (e.g., in antennas that use a coax feed, to serve as a trap to eliminate radiation from the coaxial cable, which would otherwise distort the beam). Accordingly, claims 10, 19 and 21-25 are not rendered obvious by Wicks.

Allowable Subject Matter

Applicant again acknowledges and gratefully appreciates that the Examiner has indicated that Claim 20 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

In view of the foregoing, reconsideration of claims 1-25, and passage of this application to issue, are hereby respectfully requested. If during the consideration of this paper, the Commissioner believes that resolution of the issues raised will be facilitated by further discussion, he is urged to contact the undersigned attorney at 610-691-7710 (voice) or 610-691-8434 (fax).

Respectfully,

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CLAIMS

1. An antenna structure comprising:

at least one antenna element, the at least one antenna element having at least one taper; and

a symmetrical, finite ground plane coupled with the at least one antenna element.

2. The antenna structure of Claim 1, wherein the at least one antenna element comprises a travelling wave antenna supporting a phase velocity greater than the speed of light.

3. The antenna structure of Claim 1, wherein the taper comprises a linear profile, a linear constant profile, a broken-linear profile, an exponential profile, an exponential constant profile, a tangential profile, a step-constant profile, or a parabolic profile.

4. The antenna structure of Claim 1, wherein the antenna structure supports a cigar-like directional three-dimensional beam pattern and a butterfly wing-like directional three- dimensional beam pattern.

11. An antenna structure comprising:

an array of at least two antenna elements, each antenna element having at least one taper;

a symmetrical, finite ground plane; and

an unbalanced impedance for coupling the array of at least two antenna elements with the symmetrical ground plane.

12. The antenna structure of Claim 11, wherein at least one antenna element of the array comprises a travelling wave antenna supporting a phase velocity greater than the speed of light.

13. The antenna structure of Claim 11, wherein the taper of at least one antenna element of the array comprises a linear profile, a linear constant profile, a broken-linear profile, an exponential profile, an exponential constant profile, a tangential profile, a step-constant profile, or a parabolic profile.

14. The antenna structure of Claim 11, wherein each antenna element of the array supports a cigar-like directional three-dimensional beam pattern and a butterfly wing-like directional three- dimensional beam pattern.